Small Business Innovation Research/Small Business Tech Transfer

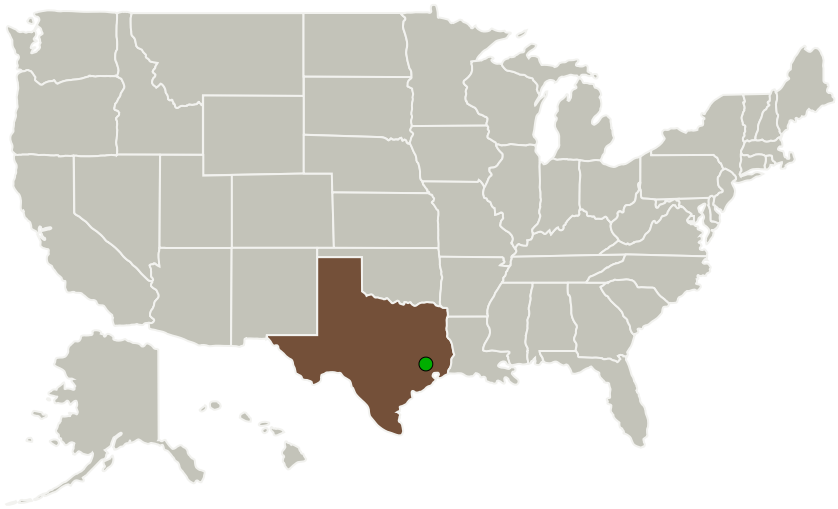
Liquid Cooled Viscoelastic Actuation for Robust Legged Robot Locomotion, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

The work proposed here seeks to significantly improve actuation technology for mission-capable articulated robots and exoskeletons such as NASA's Robonaut 2, Valkyrie, and ATHLETE systems. The goal is enabled by a new type of robotic actuation technology, Viscoelastic Liquid Cooled Actuation (VLCA), which offers improved energy efficiency, power density, and mechanical robustness over conventional actuators for space applications. The scope of the proposed work encompasses the construction and experimental evaluation of a VLCA prototype for Phase I, including the mechanical structures, avionics, and embedded control software. Additional work in Phase I will include studies on liquid cooled brushless DC motor architectures and space-compatible elastomers that will reduce risk for a detailed VLCA design and build in Phase II.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Apptronik, Inc.	Lead Organization	Industry	Austin, Texas
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Liquid cooled viscoelastic actuation for robust legged robot locomotion, Phase I

Table of Contents

Liquid Cooled Viscoelastic Actuation for Robust Legged Robot Locomotion, Phase I

Completed Technology Project (2016 - 2016)

Primary U.S. Work Locations
Texas

Project Transitions

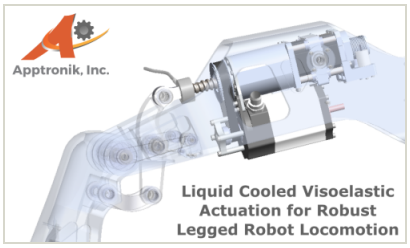
June 2016: Project Start

December 2016: Closed out

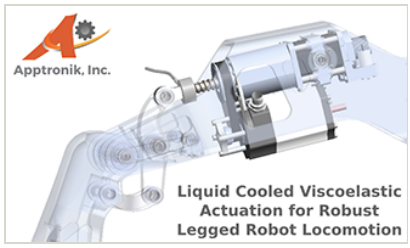
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139810)*

Images



Briefing Chart Image
Liquid cooled viscoelastic actuation for robust legged robot locomotion, Phase I
(https://techport.nasa.gov/image/131140)



Final Summary Chart Image
Liquid cooled viscoelastic actuation for robust legged robot locomotion, Phase I Project Image
(https://techport.nasa.gov/image/136187)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Apptronik, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

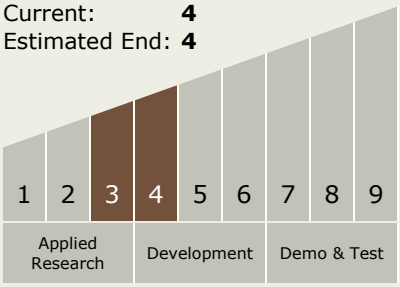
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Nicholas A Paine

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Liquid Cooled Viscoelastic Actuation for Robust Legged Robot Locomotion, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.2 Mobility
    - TX04.2.4 Surface Mobility

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System